SUPERFUND RESPONSE ACTION PRIORITY PANEL REVIEW FORM

Date Form Completed:

General Site Information

Region:	Region 8	City:	Black Hawk	State:	CO
CERCLIS EPA ID:	COD980717557		CERCLIS Site Name:	Central City/Clear Creek	
NPL Status: (P/F/D)	Final (F)		Year Listed to NPL:	1983	

Brief Site Description: *(Site Type, Current and Future Land Use, General Site Contaminant and Media Info, Site Area and Location information.)*

Site Type: The Central City/Clear Creek Superfund Site (Site) is a historic mining area located approximately 30 miles west of Denver. It was one of the most heavily mined areas in Colorado during the late 1800's, producing large quantities of metals such as gold, silver, copper, lead, nickel, and zinc. The Site contains many waste rock and tailings piles, as well as numerous tunnels that discharge acid mine drainage.

Site Location: The Study Area for the Site is located within the Clear Creek watershed, which spans approximately 400-square miles. It is located in Clear Creek and Gilpin counties. Clear Creek is used for irrigation, recreationally, and as a drinking water supply for over 300,000 people along the Front Range. Operable Unit 4 (OU4) consists of approximately 60 square miles and encompasses the North Fork of Clear Creek (North Clear Creek) and its tributaries. OU4 consists of highly variable mountainous terrain including steep canyons and narrow valley floors. The North Clear Creek basin is used recreationally for fishing, swimming and gold panning. The local communities have water rights in the basin.

Land Use: Areas where remedial activities have occurred are mostly privately owned. Some public lands were also impacted. The land where the new water treatment plant will be constructed, which is the focus of this application, is owned by the Colorado Department of Transportation. Cities within OU4 are Central City and Black Hawk. The principal economics of these cities is gambling, which was legalized in 1991.

Site Contamination: Heavy metals are the risk drivers within the Site. Within OU4, contaminants of concern (COCs) for aquatic life are zinc, copper, cadmium and manganese. COCs for human health are lead and arsenic. Mine waste and tailings piles pose a risk due to incidental ingestion or inhalation of windblown dust. Surface water and sediments contaminated with metals pose a risk to aquatic life. The water quality of North Clear Creek is severely degraded, and North Clear Creek contributes a significant metal load to the main stem of Clear Creek.

General Project Information

Type of Action:	Remedial	Site Charging SSID:	0813
Operable Unit:	4	CERCLIS Action RAT Code:	

Is this the final action for the site that will result in a site construction completion?	☐ Yes	☑ No
Will implementation of this action result in the Environmental Indicator for Human Exposure being brought under control?	☐ Yes	☑ No

Response Action Summary

Describe briefly site activities conducted in the past or currently underway:

Four operable units (OU) have been designated. Work on Operable Units 1-3 included addressing numerous waste rock and tailings piles through stabilization, capping, off-site disposal and diversion of run-on water; and construction of the Argo Tunnel water treatment plant (WTP). These actions are complete with the exception of improvements planned for the Argo Tunnel WTP.

OU4 focuses on the watershed of the North Fork of Clear Creek. Components of the OU4 ROD include: capping/removal of priority tailings/waste rock piles in the North Fork of Clear Creek drainage; treatment of discharges from the Quartz Hill, Gregory Incline and National Tunnels; collection and treatment of the Gregory Gulch drainage/ground water; and sediment control in the North Fork of Clear Creek and its tributaries. The OU4 ROD was signed on September 29, 2004. Under OU4, sediment control structures have been built and mine waste piles have been stabilized or removed to a repository constructed onsite. Stream channel stabilization is underway, and a mine water conveyance pipeline is being constructed.

Specifically identify the discrete activities and site areas to be considered by this panel evaluation:

This application is for construction of a new WTP. The OU4 ROD was amended in 2010 to select active treatment of OU4 mining impacted waters at a new WTP to be constructed near Black Hawk, CO. The WTP will treat acid mine drainage from the Gregory Incline and National Tunnels and mining impacted water from Gregory Gulch. The WTP design is a high density sludge lime precipitation process with a capacity of 600 gpm. The use of lime will increase hardness in North Clear Creek, reducing the toxic effects of remaining heavy metals. Design of the new WTP is nearing completion.

Briefly describe additional work remaining at the site for construction completion after completion of discrete activities being ranked:

The Quartz Hill waste pile requires remediation. A design was completed in 2006. However, this site is located within the gambling boundaries for Central City. Implementation of the remedy was postponed to determine if a private party would implement a remedy as part of property development. The remedy will be implemented by the agencies during 2013.

Two improvements are contemplated for the Argo Tunnel WTP. The treatment system will be converted to a high density sludge process. Design is underway, and when complete the construction project will be put out to bid. Additionally, the agencies are considering construction of a flow through bulkhead in the Argo Tunnel to prevent uncontrolled discharges of acid mine drainage. The tunnel has a history of surge events. Design should begin in 2012.

Response Action Cost

Total Cost of Proposed Response Action:

($ amount should represent total funding need for new RA funding from national allowance above and beyond those funds anticipated to be utilized through special accounts or State Superfund Contracts.)

$17,700,000 Capital Costs

$1,500,000 operation costs through Operational and Functional determination

Source of Proposed Response Action Cost Amount:
(ROD, 30%, 60%, 90% RD, Contract Bid, USACE estimate, etc…)

Exemption 5: DP

Breakout of Total Action Cost Planned Annual Need by Fiscal Year:
(If the estimated cost of the response action exceeds $10 million, please provide multiple funding scenarios for fiscal year needs; general planned annual need scenario, maximum funding scenario, and minimum funding scenario.)

In order to put the project out to bid in August 2012, the full funding amount must be received in August 2012.

Exemption 5: DP

Other information or assumptions associated with cost estimates?

The amounts above are for the total cost, including the State cost share of 10%.

Readiness Criteria

1. Date State Superfund Contract or State Cooperative Agreement will be signed (Month)?

A new State Cooperative will be signed when the RA funding is

2. If Non-Time Critical, is State cost sharing (provide details)?

Yes, the State will provide 10% of the funding.

3. If Remedial Action, when will Remedial Design be 95% complete?

June 2012

4. When will Region be able to obligate money to the site?

Mid-July 2012

5. Estimate when on-site construction activities will begin:

October 2012

6. Has CERCLIS been updated to consistently reflect project cost/readiness information?

Yes.

Site/Project Name:	Central City / Clear Creek OU4

Criteria #1 - RISKS TO HUMAN POPULATION EXPOSED (Weight Factor = 5)

Describe the exposure scenario(s) driving the risk and remedy. Include risk and exposure information on current/future use, on-site/off-site, media, exposure route, and receptors:

Media and Exposure Route: Impacted media are contaminated sediments and surface water. health hazards include direct, waterborne and food chain exposures. Exposure pathways include dermal contact and ingestion.

Use: Over 300,000 downstream residents are supplied with drinking water from Clear Creek, which is impacted by the site. Recreationalists use Clear Creek for hiking, picnicking, off-roading, gold panning, rafting, kayaking and fishing.

Receptors: Contaminants of Concern (COCs) for aquatic life include zinc, copper, cadmium and manganese. These metals are found in surface water and primarily affect fish, aquatic insects and other aquatic organisms. Acid mine drainage to North Clear Creek is lethal to many species of macroinvertebrates. Trout are at risk of acute effects in North Clear Creek. Chronic effects to aquatic life from sediments may result from the presence of zinc, cadmium, arsenic, copper and lead. North Clear Creek has no fish present from the location of the first contaminant input for several miles downstream. However, an abundant population of trout is located upstream of the contamination, and a few are located near the confluence with the mainstem. The water in North Clear Creek is acutely toxic to fathead minnow and *Ceriodaphnia*.

Risk: The OU4 Risk Assessment relied heavily on a risk analysis performed in 1990. The 1990 analysis evaluated incidental ingestion during recreational acitivities, ingestion of municipal water, dermal contact and consumption of fish as potential exposure pathways from surface water and sediment sources.

Incidental ingestion during recreational activities was determined to not pose a threat to human health under the assumed exposure conditions. However, dermal contact with low pH water can result in skin irritation.

Consumption of fish containing mercury and cadmium was evaluated, and did not pose a threat to human health under the assumed exposure conditions. However, exposures to lead in fish could not be evaluated because toxicity criteria were not available. Other chemicals of concern including zinc, copper and arsenic were also not evaluated. Consumption by children was also not evaluated.

At the time of the risk assessment, the fishery of Clear Creek was marginal. According to Paul Winkle, Colorado Division of Wildlife (CDOW) aquatic biologist, "...the water quality of the mainstem of Clear Creek has improved considerably in recent years thanks, in large part, to treatment plants built in some of the mountain communities along the river and to government-citizen group habitat restoration efforts. As a consequence...Clear Creek is a viable trout fishery today." (*CDOW Fishing Guide, 2007*). Recent projects, such as the Canyon Reach Project, conducted by Trout Unlimited have increased the accessibility of Clear Creek to families and disabled (http://www.westdenvertu.org/).

The 1990 analysis compared concentrations of metals at four municipal water diversion points with risk-based target concentrations, and determined there was no threat to human health via this pathway. However, none of the four diversions was located downstream of the North Clear Creek sources. The City of Black Hawk has filed a water right to divert surface water approximately one mile downstream of the sources. The City of Golden obtains their drinking water from Clear Creek, approximately 19 miles downstream of the contaminated inputs. Despite this distance, Golden regularly has to shut their water intake due to high concentrations of metals or total suspended solids. In 2010, the intake was closed 6 times due to unacceptable loadings from Clear Creek. The City of Golden's water supply is exclusively from Clear Creek and there is no storage capacity to allow them to stay offline.

Estimate the number of people reasonably anticipated to be exposed in the absence of any future EPA action for each medium for the following time frames:

MEDIUM	<2yrs	<10yrs	>10yrs
Sediment	200	1,000	10,000
Surface Water	1,000	10,000	100,000

Assumes linear increase (i.e. 100 unique individuals exposed to sediments each year)

Discuss the likelihood that the above exposures will occur:

A 1990 ATSDR study of Black Hawk, Central City and Idaho Springs found about 9% of children tested had a blood lead level exceeding 10 ug/dL. There was a significant statistical association between blood lead levels exceeding 10 ug/dL and soils containing greater than 500 ppm lead. Remedial actions have occurred on Operable Units 1-3, which included addressing numerous priority waste rock and tailings piles through stabilization, capping or off-site disposal. Under OU4, additional priority piles have been stabilized or removed to a repository constructed onsite.

Contaminated waters, and related contaminated sediments, located in the OU4 area are the focus of this application.

The Site is located very near the Denver metropolitan area, in mountainous terrain used by recreationalists. Gold panning in contaminated surface water/sediments is a common pastime for Colorado residents and tourists, particularly in North Clear Creek. Rafting and kayaking in Clear Creek is a popular activity. An estimated 60,000 people raft in Clear Creek each year. Fishing is common in both mainstem Clear Creek and North Clear Creek.

The nearby cities of Black Hawk and Central continue to experience population growth due to the legalization of gambling. Construction of hotel lodging for overnight guests is also drastically increasing.

Other Risk/Exposure Information?

Impacts to drinking water supplies from a mine tunnel blowout could occur at any time.

Site/Project Name: **Central City / Clear Creek OU4**

Criteria #2 – SITE/CONTAMINANT STABILITY (Weight Factor = 5)

Describe the means/likelihood that contamination could impact other areas/media given current containment:

Currently, there is no containment. Acid mine drainage discharges into North Clear Creek significantly impacts the creek. Mainstem Clear Creek is also impacted, to a lesser extent. Clear Creek is a drinking water supply for over 300,000 residents in the Denver metropolitan area.

Surface water aquatic life standards are exceeded for aluminum, cadmium, copper, iron, manganese and zinc. Sediment samples also have elevated metal concentrations.

Storm events transport visible particulates from the contaminated surface tailings / waste piles into North Clear Creek.

The Gregory Incline and National Tunnel discharge acidic mine drainage. At any time, an impoundment within the tunnels could break and release contaminated water into North Clear Creek. A significant surge event could cause acute damage to the Clear Creek fishery, and could impact downstream users including municipal drinking water supplies.

Are the contaminants contained in engineered structure(s) that currently prevents migration of contaminants? Is this structure sound and likely to maintain its integrity?

No

Are the contaminants in a physical form that limits the potential to migrate from the site? Is this physical condition reversible or permanent?

The contaminants occur in acid mine drainage discharging from tunnels into North Clear Creek. Some of the contaminants are sorbed or precipitated onto sediments. However, contaminants also impact the mainstem of Clear Creek, below the confluence of North Clear Creek 8 miles below the contaminant inputs. During high flow events, sorbed or precipitated contaminants are remobilized and travel further downstream.

Although North Clear Creek contributes an average of only 7% of the flow into mainstem Clear Creek, it contributes 30% of the copper load, 24% of the zinc load, 31% of the manganese load, 27% of the iron load, and 13% of the lead load.

Are there institutional physical controls that currently prevent exposure to contamination? How reliable is it estimated to be?

No

Other information on site/contaminant stability?

Site/Project Name:	**Central City / Clear Creek OU4**

Criteria #3 – CONTAMINANT CHARACTERISTICS (Weight Factor = 3)

(Concentration, toxicity, and volume or area contaminated above health based levels)

List Principle Contaminants (Please provide average and high concentrations.):

(Provide upper end concentration (e.g. 95% upper confidence level for the mean, as is used in a risk assessment, or maximum value [assuming it is not a true outlier], along with a measure of how values are distributed {e.g. standard deviation} or a central tendency values [e.g., average].)

Contaminant	***Media**	****Concentrations**
Zinc	SW	[1]Average 7400 ug/L, Maximum 30000 ug/L
Copper	SW	[1]Average 1000 ug/L, Maximum 12000 ug/L
Cadmium	SW	[1]Average 24 ug/L, Maximum 170 ug/L
Manganese	SW	[1]Average 15000 ug/L, Maximum 46000 ug/L
Iron	ST	[2]Mean 19700 mg/kg, Maximum 34700 mg/kg
Zinc	ST	[2]Mean 290 mg/kg, Maximum 640 mg/kg

Copper	ST	[2]Mean 120 mg/kg, Maximum 290 mg/kg
Lead	ST	[2]Mean 180 mg/kg, Maximum 820 mg/kg
Cadmium	ST	[2]Mean 1.1 mg/kg, Maximum 5.3 mg/kg
Arsenic	ST	[2]Mean 21 mg/kg, Maximum 44 mg/kg

*(*Media: AR – Air, SL – Soil, ST – Sediment, GW – Groundwater, SW – Surface Water)*

*(**Concentrations: Provide concentration measure used in the risk assessment and Record of Decision as the basis for the remedy.)*

[1]Industrial Facilities Engineering, Inc. 2010. Central City/Clear Creek Superfund Site OU #4 Source Characterization Data Report

[2]Water Science and Engineering. 1995. Chemical and Physical Assessment of North Clear Creek During July 1994. Prepared for START.

Describe the characteristics of the contaminant with regards to its inherent toxicity and the significance of the concentrations and amount of the contaminant to site risk. *(Please include the clean up level of the contaminants discussed.)*

Remediation Goals (RGs) were established for surface water for high flow and low flow periods, respectively. The RGs are values expected to be protective of Brown Trout. The North Clear Creek RGs are:

Zinc 381 ug/L / 675 ug/L Copper 7.4 ug/L / 15.1 ug/L

Cadmium 1.9 ug/L / 3.5 ug/L Manganese 1531 ug/L / 2021 ug/L

The RGs are generally higher for low flow periods due to the higher hardness associated with that flow regime.

Acute surface water Toxicity Reference Values (TRVs) for trout are exceeded for cadmium, copper and zinc in North Clear Creek during both high and low flow conditions. Chronic TRVs for trout are exceeded for cadmium, copper, iron, manganese, and zinc in North Clear Creek during high flow conditions; and aluminum, cadmium, copper, iron, lead, manganese, nickel, lead and pH are exceeded during low flow conditions

Toxicity testing indicates 100% mortality of *Ceriodaphnia dubia*, and approximately 50% mortality for *Pimephales* within North Clear Creek. Trout are more sensitive than *Pimephales* for the chemicals of concern.

Hazard Indices for North Clear Creek ranged from 23.0 just below the mine discharges to 1.2 at the mouth, 8 miles downstream.

Describe any additional information on contaminant concentrations which could provide a better context for the distribution, amount, and/or extent of site contamination. *(e.g. frequency of detection/outlier concentrations, exposure point concentrations, maximum or average concentration values, etc.....)*

Storm events contribute a significant metal load into surface water.

Other information on contaminant characteristics?

North Clear Creek below the input of the tunnel discharges is acutely toxic to fish and macroinvertebrates. The confluence of North Clear Creek with mainstem Clear Creek is approximately 8 miles downstream of the inputs. Chronic reproductive effects are observed in mainstem Clear Creek where trout populations are diminished below the confluence with North Clear Creek.

Zinc and copper metal toxicity is additive in combination.

Site/Project Name:	**Central City / Clear Creek OU4**

Criteria #4 – THREAT TO SIGNIFICANT ENVIRONMENT (Weight Factor = 3)

(Endangered species or their critical habitats, sensitive environmental areas.)

Describe any observed or predicted adverse impacts on ecological receptors including their ecological significance, the likelihood of impacts occurring, and the estimated size of impacted area:

North Clear Creek is impacted for approximately 8 miles, from the first input of contamination to its confluence with Clear Creek. Clear Creek is additionally impacted another 11 miles. Both North Clear Creek and the mainstem are designated Cold Water Aquatic Life segments. Cadmium, copper and zinc are the metals having the most significant negative impact on the Clear Creek aquatic ecosystem.

North Clear Creek has no fish present from the location of the first contaminant input for several miles downstream. However, an abundant population of trout is located upstream of the contamination, and a few are located near the confluence with the mainstem. The water in North Clear Creek is acutely toxic to fathead minnow and *Ceriodaphnia*.

The aquatic macroinvertebrate community in Clear Creek below the contaminant inputs has a low diversity and abundance, compared to upper reaches of the stream. Trout numbers are depressed. Copper concentrations are often acutely toxic to brown trout.

Canada Lynx and Mexican Spotted Owl are threatened species known to frequent Gilpin County.

Would natural recovery occur if no action was taken? ☐ Yes ☑ No
If yes, estimate how long this would take.

Other information on threat to significant environment?

Site/Project Name:	**Central City / Clear Creek OU4**

Criteria #5 – PROGRAMMATIC CONSIDERATIONS (Weight Factor = 4)

(Innovative technologies, state/community acceptance, environmental justice, redevelopment, construction completion, economic redevelopment.)

Describe the degree to which the community accepts the response action.

In response to the Proposed Plan, the agencies received letters of support from a local watershed group, the City of Black Hawk, and two local residents. Gilpin County Commissioners have also expressed support. The agencies have been working with project stakeholders including Black Hawk, Gilpin County, local business districts, Colorado Department of Transportation, Colorado Division of Parks and Recreation and Trout Unlimited.
Describe the degree to which the State accepts the response action.
The State is the lead agency on the site, and EPA and the State are in full concurrence on the response action.
Describe other programmatic considerations, e.g.; natural resource damage claim pending, Brownfields site, use of innovative technology, construction completion, economic redevelopment, environmental justice, etc…
This is the final major action that is required prior to the site being eligible for deletion from the NPL. Considerable funding has already gone into advancing this project. $5,900,000 has been spent on design and construction of the conveyance pipeline, site preparation and WTP design.